

REMARKS

Applicants respectfully request the Examiner to reconsider the present application in view of the foregoing amendments to the claims and the following remarks.

Status of the Claims

Claims 1-23 are currently pending in the present application. The Office Action is non-final. Claims 11-12 and 22-23 have been cancelled without prejudice or disclaimer. No new matter has been added.

Based upon the above considerations, entry of the present amendment is respectfully requested.

Rejection Under 35 U.S.C §112, Second Paragraph, Indefiniteness

Claims 11-12 and 22-23 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter, which Applicants regard as the invention.

Applicants have cancelled claims 11-12 and 22-23, without prejudice or disclaimer, therefore obviating the present rejection.

Applicants request reconsideration and withdrawal of the present rejection.

Rejections Under 35 U.S.C. § 102(b), Anticipation and/or 35 U.S.C. § 103(a), Obviousness

Claims 1-2, 4, 7-13, 15, 18-23 stand rejected under 35 U.S.C. § 102(a) as anticipated by or, in the alternative, obvious under 35 U.S.C. § 103(a) over JP 08090150 (hereinafter “JP ‘150”).

Claims 11-12 and 22-23 have been cancelled herein without prejudice or disclaimer, thus obviating the rejection as to these claims. Applicants traverse the rejection as to the remaining claims as set forth herein.

Claims 3, 5-6, 14 and 16-17 stand rejected under 35 U.S.C. § 103(a) as obvious over JP ‘150 in view of Anzai *et al.*, U. S. Patent No. 4,923,520 (hereinafter “Anzai *et al.*”).

Legal Standard for Determining Anticipation

For anticipation under 35 U.S.C. §102, the reference “must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present.” (MPEP §706.02, Rejection on Prior Art [R-1]). The Federal Circuit has held that prior art is anticipatory only if every element of the claimed invention is disclosed in a single item of prior art in the form literally defined in the claim. *See Jamesbury Corp. v. Litton Indus. Products*, 756 F.2d 1556, 225 USPQ 253 (Fed. Cir. 1985); *see also Atlas Powder Co. v. du Pout*; 750 F.2d 1569, 224 USPQ 409 (Fed. Cir. 1984); *American Hospital Suppl v. Travenol Labs*, 745 F.2d 1, 223 USPQ 577 9 (Fed. Cir. 1984).

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” (*See, Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987)).

“When a claim covers several structures or compositions, either generically or as alternatives, the claim is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior art.” *Brown v. 3M*, 265 F.3d 1349, 1351, 60 USPQ2d 1375, 1376 (Fed. Cir. 2001) “The identical invention must be shown in as complete detail as is contained in the ... claim.” *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Legal Standard for Determining Prima Facie Obviousness

A proper obviousness inquiry requires consideration of three factors: (1) the prior art reference (or references when combined) must teach or suggest all the claim limitations; (2) whether or not the prior art would have taught, motivated, or suggested to those of ordinary skill in the art that they should make the claimed invention (or practice the invention in case of a claimed method or process); and (3) whether the prior art establishes that in making the claimed invention (or practicing the invention in case of a claimed method or process), there would have been a reasonable expectation of success. *See* M.P.E.P. § 2143.

Graham v. John Deere, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), has provided the controlling framework for an obviousness analysis. A proper analysis under § 103(a) requires consideration of the four *Graham* factors of: determining the scope and content of the prior art; ascertaining the differences between the prior art and the claims that are at issue; resolving the level of ordinary skill in the pertinent art; and evaluating any evidence of secondary considerations (e.g., commercial success; unexpected results). 383 U.S. at 17, 148 USPQ at 467.

The teaching, suggestion, motivation test is a valid test for obviousness, but one which cannot be too rigidly applied. *See KSR International Co. v Teleflex Inc.*, 82 USPQ2d 1385, 1395

(U.S. 2007). While the courts have adopted a more flexible teaching/suggestion/motivation (TSM) test in connection with the obviousness standard based on the *KSR v. Teleflex* case which involved a mechanical device in a relatively predictable technological area, it remains true that, despite this altered standard, the courts recognize inventors face additional barriers in relatively unpredictable technological areas as noted in *Takeda Chemical Industries, Ltd. v. Alphapharm Pty., Ltd.*, 83 USPQ2d 1169 (Fed. Cir. 2007) (since TSM test can provide helpful insight if it is not applied as rigid and mandatory formula, and since, in cases involving new chemical compounds, it remains necessary to identify some reason that would have led chemist to modify known compound, in particular manner, in order to establish *prima facie* obviousness of new compound).

“In determining the propriety of the Patent Office case for obviousness in the first instance, it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the reference before him to make the proposed substitution, combination, or other modification.” *In re Linter*, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972).

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. “The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art.” *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also *In*

re Lee, 277 F.3d 1338, 1342-44, 61 USPQ2d 1430, 1433-34 (Fed. Cir. 2002) (discussing the importance of relying on objective evidence and making specific factual findings with respect to the motivation to combine references); *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

Distinctions Over the Cited Art

Rejection of claims 1-2, 4, 7-10, 13, and 18-21 based on JP '150.

The Office Action states that JP '150 teaches the presently claimed casting including a steel product produced by the claimed casting mold, wherein the casting mold (self-curing mold) is produced by spherical mullite based 0.5-1.5 mm ceramic sand 8 which contains a 61.7:35.5 wt. ratio of Al_2O_3 and SiO_2 , and the spherical degree of the mullite sand is less than 0.95 (index below 1.1, based on index one for the perfect sphere). The Office Action further states that even if the spherical mullite based ceramic sand 8 is not produced by the process of fusing in flame, the claimed sand, mold casting and construction products are still obvious over JP '150, because the spherical mullite based ceramic sand 8 has the claimed properties and the casting molds are removed from the casting products after casting. Applicants respectfully traverse.

The spherical mullite based ceramic sand of JP '150 is prepared by a granulation calcination method according to the description in paragraph [0018]. This granulation calcination method within JP '150 cannot produce ceramic sand having a high spherical degree. Additionally, the spherical mullite based ceramic sand are coarse particles as shown in paragraph [0018].

By contrast, in the present invention, the spherical molding sand produced has a high spherical degree, i.e., at least 0.95, which could not be achieved by a granulation calcination method. The spherical molding sand of this high spherical degree can be obtained by the flame fusion method. Further, ceramic sand prepared by a granulation calcination method as in JP '150 is porous and poor in intensity (*See* Table 2 of JP '150). Whereas, in the present invention, the sand is prepared by the flame fusion method so that the structural feature of compactness can be provided (see page 7, lines 3-6 in the present specification).

Thus, because JP '150 lacks disclosure of producing spherical molding sand of high spherical degree since it uses a granulation calcination method, and the spherical molding sand produced is of a poorer quality than that of the present invention, the ceramic sand of JP '150 is much different than that of the present invention. Therefore, because of the lack of disclosure of all features as instantly claimed, the rejection is obviated in view of JP '150 and is overcome.

Additionally, it is thus clear that JP '150 fails to teach or suggest the flame fusion method of the present invention which produces ceramic sand having high a spherical degree. A skilled artisan is not motivated to modify JP '150 towards the present invention. For such reasons, the rejection is without basis and should be withdrawn.

Applicants respectfully request reconsideration and withdrawal of the present rejection.

Rejection of claims 3, 5-6, 14 and 16-17 based on JP '150 in view of Anzai et al.

The Office Action states that JP '150 fails to teach the use of a particular low water absorbency in specifying the molding sand in claims 3 and 14 and it also fails to teach the use of fusing in flame in claims 6 and 17. However, the Examiner suggests that Anzai *et al.* teach the use of fusion in flame process for the purpose of promoting fused silica having spherical degree of more than 0.99 or 99 volume percent, which are in perfect spherical form, and water absorption of about 0.21 wt% and less than 0.8 wt%. The Examiner further suggests that it would have been obvious to one having ordinary skill in the art to provide JP '150 the use of molding sand having low water absorbency in specifying the molding sand and the use of fusing in flame process as taught by Anzai *et al.* in order to improve flow ability, de-gassing and promote mechanical strength.

With regards claims 5 and 16, although the Examiner states that JP '150 in view of Anzai *et al.* fails to teach the use of 50% of spherical molding sand, the use of 50% of spherical molding sand in the mixture of molding sand would have been obvious to one having ordinary skill in the art in order to provide the mixed molding with improved flow ability, de-gassing and promoted mechanical strength. Applicants respectfully traverse

As noted above in the previous rejection, it is clearly described at paragraph [0018] in JP '150 that coarse particles are used as ceramic sand. Thus, it is never motivated in JP '150 to prepare ceramic sand of higher spherical degree by the method of Anzai *et al.* so that JP '150 teaches away from combination with Anzai *et al.*

Additionally, Anzai *et al.* actually teaches away from using spherical fused silica of 50 μm or greater (see Anzai *et al.* column 3 lines 60 to 68). Anzai *et al.* mentions that "proportions

of particles that are not fully fused, e.g., which do not do not become non-crystalline throughout, or which are not fully spherical in shape, increase when fused silica having an average particle diameter above 50 μm is to be produced.”

It appears that Anzai *et al.* reinforces this limitation in the technology by indicating in the Manufacturing Example, Examples 1-10 and Table 1 that the spherical fused silica were less than 50 μm in diameter (see Anzai *et al.*, column 4, line 8 to column 6 line 15). One skilled in the art therefore would not use Anzai *et al.* to produce spherical fused silica of 50 μm or greater due to Anzai *et al.*, warning of producing inferior quality and shape of the fused silica spheres.

In regards to the Examiner’s assertions for claims 5 and 16, Anzai *et al.* teaches away from the use of spherical fused silica of 50 μm or greater due to inferior sphere qualities. One skilled in the art, knowing that Anzai *et al.* would not use the larger size spheres due to inferior quality, would not use 50% spherical molding sand since the qualities cited by the Examiner (improved flow ability, de-gassing and promoted mechanical strength) found in Anzai *et al.* would be compromised in the mixed molding by using spherical fused silica of 50 μm or greater.

Also, the difference between the granulation calcination method of JP ‘150 and the flame fusion method of the present invention is clearly shown in Example 1 (spherical degree: 0.99) and Comparative Example 1 (spherical degree: 0.89), and further clarified in Figs. 1 and 2 of this application.

Since JP ‘150 fails to teach or suggest the flame fusion method of the present invention which produces ceramic sand having high a spherical degree, a skilled artisan is not motivated to

modify JP '150 towards the present invention. Also based on the above, Anzai *et al.* actually teach away from the present invention. For such reasons, the rejection is without basis and should be withdrawn.

Applicants respectfully request reconsideration and withdrawal of the present rejection.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

CONCLUSION

In view of the above amendment and comments, Applicants respectfully submit that the claims are in condition for allowance. A notice to such effect is earnestly solicited.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Paul D. Pyla, Reg. No. 59,228, at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

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